

OPHIOTAENIA CRITICA (CESTODA: PROTEOCEPHALIDAE),
A PARASITE OF THE COLORADO RIVER SQUAWFISH

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ABSTRACT.— A total of 19 cestodes, *Ophiotaenia* sp., were recovered by deworming from adult Colorado River Squawfish (*Pteichocheilus lucius*) maintained at the U.S. National Fish Hatchery at Willow Beach, Arizona. These specimens differ from other described species and are named *Ophiotaenia critica*.

Reports concerning the helminth parasites of native Arizona fishes are limited. Unfortunately, some hosts, such as the Colorado River Squawfish, *Pteichocheilus lucius*, are currently considered endangered and hence are difficult to examine for their parasitic fauna. Vanicek and Kramer (1969) reported the proteocephalid tapeworm *Proteocephalus ambloplitis* from *P. lucius* and *Gila robusta*. Buckner (1972) reported the proteocephalid *Ophiotaenia fragile* from *P. lucius*. Specimens of *Ophiotaenia* reported from *P. lucius* in the present study appear distinctive and warrant specific status.

MATERIALS AND METHODS

During October 1979, we participated with personnel of the U.S. National Fish Hatchery at Willow Beach, Arizona, in recovering tapeworms that were purged by deworming from some adult squawfish maintained at the hatchery. Isolated portions of the raceways containing the treated hosts were observed over a three-day period and voided worms collected hourly. Tapeworms collected were rinsed in Ringer's solution, lightly compressed between glass plates and fixed with AFA. Specimens were taken to our laboratory at Arizona State University for treatment and study. Subsequently (April 1980), Mr. Roger Hammond of the Willow Beach Hatchery treated additional adult squawfish, collected the voided cestodes, and, after rinsing and fixing as outlined above, provided us with the specimens. In the October 1980 deworming procedure, the anti-

helminthic used was Di-N-butyl Tin Oxide in graded dosages of 480 mg, 960 mg, and 1120 mg per fish per day. In the April 1980 treatment, the hosts were treated once with oxytetracycline HCl (Terramycin) at a rate of 25 mg/pound of fish body weight, with no anti-helminthic drug used.

Specimens were stained with Grenacher's alcoholic borax carmine, Semichon's acetic carmine, and Harris's hematoxylin, using procedures of Meyer and Olsen (1975). Nineteen worms were collected and studied.

RESULT AND DISCUSSION

Tapeworms recovered from squawfish were identified as *Ophiotaenia*, using the keys of Schmidt (1970). Most species in this genus have been reported from amphibian and reptilian hosts with two exceptions from piscine hosts: *O. fragile* (Essex, 1929) (*Crepidobothrium fragile* Essex, 1929) from *Ictalurus punctatus* (Channel Catfish), and *O. synodontis* Woodland 1925 from a siluroid fish, *Synodontis schall*. Freze (1965) proposed that members of the genus *Ophiotaenia* be restricted to species from amphibian and reptilian hosts and that *O. fragile* and *O. synodontis* be assigned to the genus *Proteocephalus* since he felt that the generic characteristic of *testes in two lateral fields* of other authors may be inconsistent. He felt that the generic characteristic of *preformation of the uterus* for amphibian and reptilian members of *Ophiotaenia* sp. of other authors was "unclear." Because of ambiguity regarding embryological devel-

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opment of the uterus as well as position of the preformed uterus, we, along with many others, reject this generic characterization of *Ophiotaenia*. The generic criterion of development and of the *testes in two lateral fields* for *Ophiotaenia*, as used by Wardle and McLeod (1952), Yamaguti (1959), Wardle et al. (1974), and Schmidt (1970), seems more logical than defining a genus by host taxon (fish and amphibian hosts share a common habitat in part).

Ophiotaenia recovered from *P. lucius* resemble *O. fragile* more closely than other described species of *Ophiotaenia*, although there are striking differences; these are summarized in Table 1.

Ophiotaenia critica, n. sp.

HOLOTYPE: UNSM 00000, from *Pteichocheilus lucius*, Willow Beach U.S. National Hatchery, Mohave Co., Arizona; April 1980; collected by Roger Hammond.

PARATYPES: USNM 00000, data as holotype.

DIAGNOSIS: (1) Medium size tapeworm, up to 360 mm by 0.4 to 2.02 mm; (2) rounded scolex without apical organ; (3) proglottids typically wider than long; (4) testes 80 to 270 in number situated in two lateral fields; (5) cirrus sac occupying from 1/7 to 1/4 of proglottid width; (6) short cirrus, 0.08 to 0.21 mm long; (7) genital pore not situated on a papilla; (8) vagina always anterior to and never crossing cirrus sac; (9) no vaginal sphincter; (10) five to nine uterine pouches

unilaterally, usually reaching vitelline bands; (11) parasite of fish.

DESCRIPTION (based on 19 specimens): the Strobila is up to 360 mm long with a maximum width of 2.02 mm. The scolex measures 0.7 to 1.1 mm long and 0.79 to 1.69 mm wide. It is rounded but with a slightly pointed apex (Fig. 1). There are four antero-laterally directed, rounded suckers, 0.32 to 0.61 mm in diameter. The apical sucker is absent. The neck is 7.42 to 13.68 mm long, 0.32 to 1.44 mm wide. It is narrower than the scolex anteriorly (Fig. 1). Most proglottids are broader than long.

There are 80 to 270 testes, 0.02 to 0.4 mm in diameter, in two lateral fields. The vas deferens is straight extrabursally in young proglottids; coiled intra- and extrabursally in older ones (Fig. 2). In gravid proglottids the coils form a medullary mass up to 0.5 mm long. The cirrus sac is 0.20 to 0.35 mm long, 0.07 to 0.11 mm wide, occupying from 1/7 to 1/4 of proglottid width. The cirrus is short, 0.08 to 0.21 mm long.

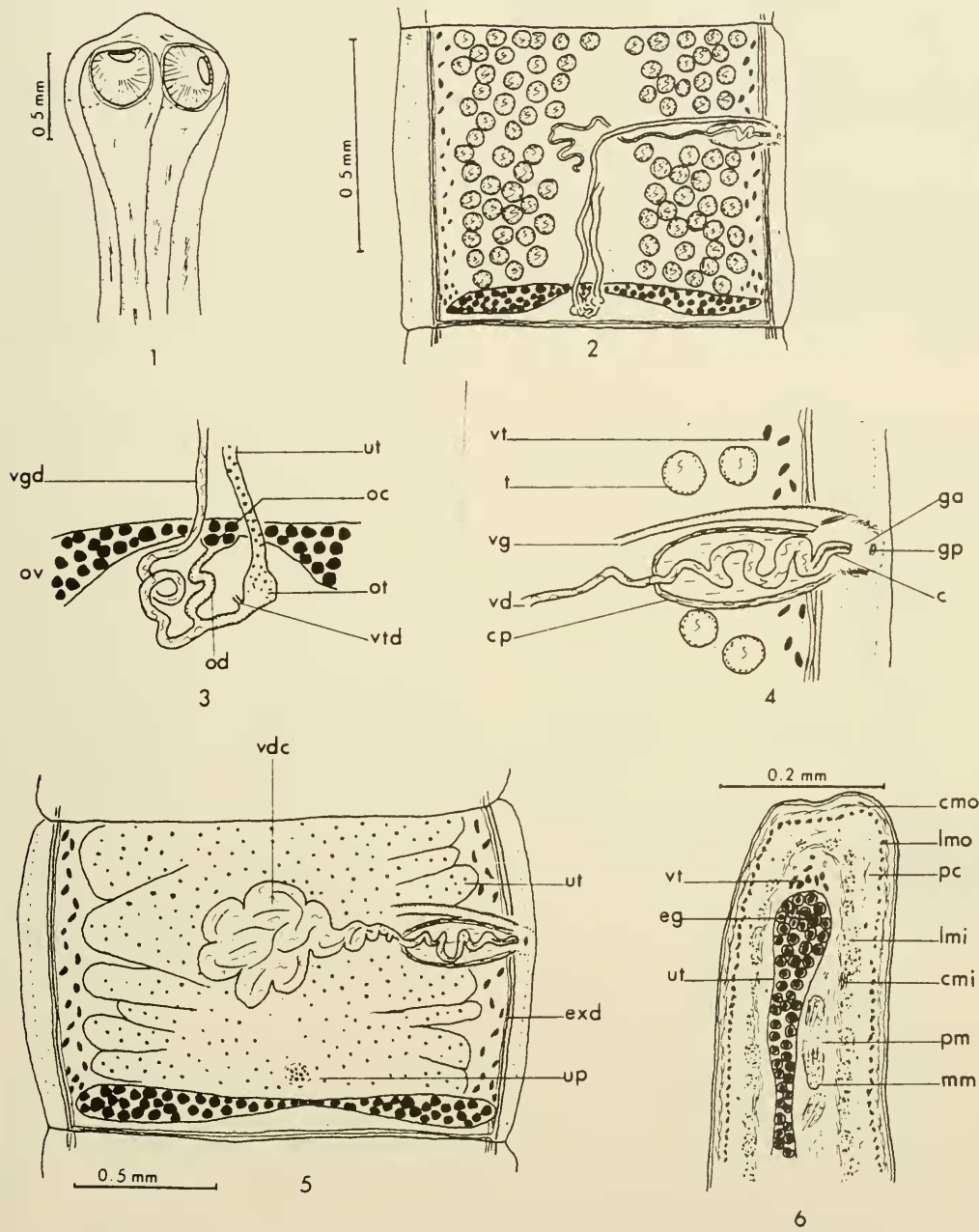
The genital pore is at either the left or right lateral margin of each segment, anterior to median transverse axis. No genital papilla is present.

There are two lateral bands of follicular vitellaria slightly more massive posteriorly. The ovarian lobes are slender and more pointed laterally in younger proglottids. The vagina is anterior to the cirrus sac and never crosses the latter. There is no vaginal sphincter (Fig. 4). The organs of the interovarian space are as in most proteocephalata (Fig. 3).

TABLE 1. Comparison of *Ophiotaenia critica* with *O. fragile*, the most similar congener.

Character	<i>O. fragile</i>	<i>O. critica</i>
Eversion of cirrus	high frequency	no tendency
Length of cirrus	0.88-1.24 mm	0.08-0.21 mm
Vagina	anterior or posterior to cirrus sac	anterior to cirrus sac
Vaginal sphincter	well developed	absent
Scolex	0.5-0.5 mm	0.7-1.1/0.7-1.7 mm
Total strobila length	45-80 mm	up to 360 mm
Fragility	high	normal
Uterine pouches	7-12 pairs	5-9 pairs
Number of testes	150-230	80-270
Diameter of testes	0.07-0.09 mm	0.02-0.04 mm
Uterine pouches	fall short of vitallaria (testes between vitellaria and uterine pouches)	reach vitellaria (testes usually disappear)
Diameter of onchosphere	0.013-0.016 mm	0.017-0.021 mm
Cirrus sac size	0.16-0.19/0.30-0.35 mm	0.20-0.35/0.07-0.11 mm

The uterus has 5 to 9 pairs of lateral proglottids and the testes then disappear. There are one to three uterine pores in the central area of each segment. The



Figs. 1-6. *Ophiotaenia critica*: 1, scolex and portion of neck; 2, mature proglottid; 3, female reproductive organs; 4, reproductive system; area of gonopore; 5, gravid proglottid; 6, transversal section through a gravid proglottid (half represented). Abbreviations: c, cirrus; cmo, outer circular musculature; cmi, inner circular musculature; cp, cirrus pouch; eg, eggs; exd, excretory duct; ga, genital atrium; gp, genital pore; lmo, outer longitudinal musculature; lmi, inner longitudinal musculature; mm, medullary musculature; oc, oocapt; od, oviduct; ot, ootype; ov, ovary; pc, cortical parenchyma; pm, medullary parenchyma; t, testes; up, uterine pore; ut, uterus; vd, vas deferens; vdc, coils of vas deferens; vg, vagina; vgd, vaginal duct; vt, vittellaria; vtd, vitteline duct.

onchospheres are 0.017 to 0.021 mm in diameter.

The reproductive organs are in the medullary parenchyma (Fig. 6).

ETYMOLOGY: The specific name is derived from the latin *criticus*, meaning critical, or decisive, and is used in reference to the endangered status of the host.

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